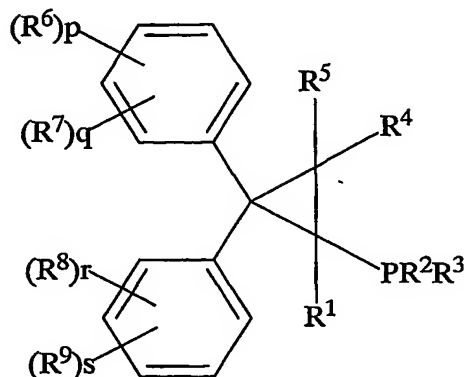


## CLAIMS

1. A phosphine compound of formula (1),



(1)

wherein  $R^1$  is a hydrogen atom, an alkyl group, a cycloalkyl group or a phenyl group which may be substituted;  $R^2$  and  $R^3$  are each, the same or different, an alkyl group, a cycloalkyl group or a phenyl group which may be substituted;  $R^4$  and  $R^5$  are each, the same or different, a hydrogen atom, an alkyl group, a cycloalkyl group or a phenyl group which may be substituted;  $R^6$ ,  $R^7$ ,  $R^8$  and  $R^9$  are each, the same or different, an alkyl group, a cycloalkyl group, a phenyl group which may be substituted, an alkoxy group, a dialkylamino group, a halogen atom, a benzyl group, a naphthyl group or a halogenated alkyl group;  $R^6$  and  $R^7$ , or  $R^8$  and  $R^9$  each may be combined to form, a fused ring, a trimethylene group, a tetramethylene group or a methylenedioxy group;  $p$ ,  $q$ ,  $r$  and  $s$  are each an integer of from 0 to 5; and  $p + q$ , and  $r + s$  are each in the range of from 0 to 5.

2. A palladium-phosphine complex which can be obtained by reacting the phosphine compound of claim 1 with a palladium compound.

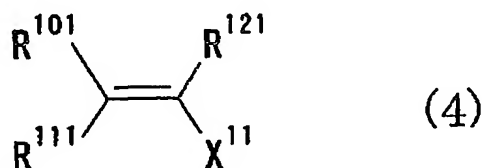
3. The palladium-phosphine complex of claim 2, wherein the palladium compound is a palladium salt or a palladium complex in which the valency of palladium is 4, 2 or 0.

5

4. A manufacturing method of an unsaturated compound or an aromatic compound by the use of palladium-phosphine complexes mentioned in claim 2 or 3 as a catalyst.

10 5. A manufacturing method of an unsaturated compound or an aromatic compound by the use of the phosphine compound mentioned in claim 1 and a palladium compound.

6. The manufacturing method of claim 4 or 5, which comprises  
15 reacting a compound of formula (3) or (4) below:

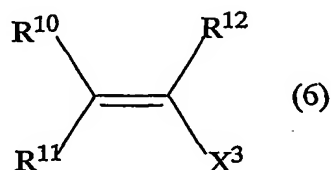


wherein, in formula (3),  $\text{Ar}^1$  is an aryl group which may be substituted or a heteroaryl group which may be substituted;  $\text{X}^1$   
20 is a chlorine atom, a bromine atom, an iodine atom, a trifluoromethanesulfonyloxy group, a methanesulfonyloxy group or a para-toluenesulfonyloxy group and  $m^1$  is an integer of 1 to 4, and,

in formula (4),  $\text{R}^{101}$ ,  $\text{R}^{111}$  and  $\text{R}^{121}$  are each, the same or  
25 different, a hydrogen atom, an alkyl group, an aryl group which may be substituted, a heteroaryl group which may be substituted,

an alkoxy carbonyl group or a cyano group;  $X^{11}$  is a chlorine atom, a bromine atom, an iodine atom, a trifluoromethanesulfonyloxy group, a methanesulfonyloxy group or a para-toluenesulfonyloxy group,

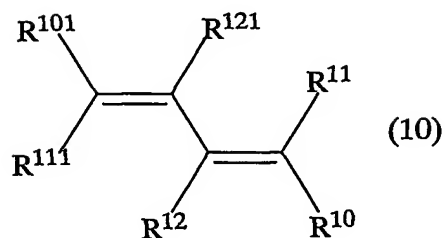
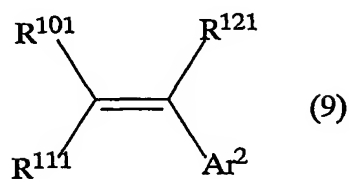
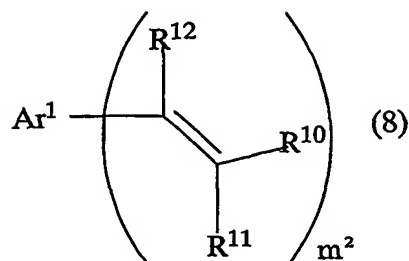
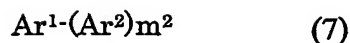
5 with a compound, of formula (5) or (6) below,



wherein, in formula (5),  $Ar^2$  is an aryl group which may be substituted or a heteroaryl group which may be substituted;  $X^2$  is  $B(OR^{13})(OR^{14})$ ,  $Sn(R^{15})_3$ ,  $MgX$ ,  $ZnX$ ,  $Al(R^{15})_2$  or  $Li$ , and,

10 in formula (6),  $R^{10}$ ,  $R^{11}$  and  $R^{12}$  are each, the same or different, a hydrogen atom, an alkyl group, an aryl group which may be substituted, a heteroaryl group which may be substituted, an alkoxy carbonyl group or a cyano group;  $R^{10}$  and  $R^{12}$  may be combined to form a single bond, forming together with the existing double  
15 bond a triple bond;  $X^3$  is a hydrogen atom,  $B(OR^{13})(OR^{14})$ ,  $Sn(R^{15})_3$ ,  $MgX$ ,  $ZnX$ ,  $Al(R^{15})_2$  or  $Li$ ;  $R^{13}$  and  $R^{14}$  are each, the same or different, a hydrogen atom, an alkyl group, or, combined to form an ethylene group or a 1,2-dimethylethylene group;  $R^{15}$  is an  
20 alkyl group, and  $X$  is a chlorine atom, a bromine atom or an iodine atom,  
to give a compound of formula (7), (8), (9) or (10),

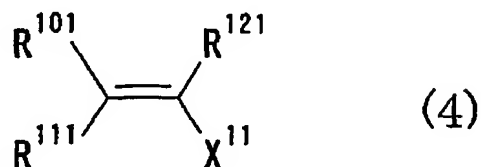
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wherein  $\text{Ar}^1$ ,  $\text{Ar}^2$ ,  $\text{R}^{10}$ ,  $\text{R}^{11}$ ,  $\text{R}^{12}$ ,  $\text{R}^{101}$ ,  $\text{R}^{111}$  and  $\text{R}^{121}$  are as defined above and  $m^2$  is an integer of 1 to 4.

5

7. A manufacturing method of claim 4 or 5, which comprises reacting a compound of formula (3) or (4) below,



10 wherein, in formula (3),  $\text{Ar}^1$  is an aryl group which may be substituted or a heteroaryl group which may be substituted;  $\text{X}^1$  is a chlorine atom, a bromine atom, an iodine atom, a trifluoromethanesulfonyloxy group, a methanesulfonyloxy group

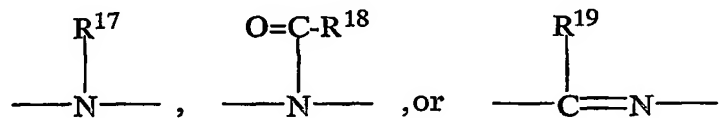
or a para-toluenesulfonyloxy group and  $m^1$  is an integer of from 1 to 4, and,

in formula (4),  $R^{101}$ ,  $R^{111}$  and  $R^{121}$  are each, the same or different, a hydrogen atom, an alkyl group, an aryl group which may be substituted, a heteroaryl group which may be substituted, an alkoxy carbonyl group or a cyano group;  $X^{11}$  is a chlorine atom, a bromine atom, an iodine atom, a trifluoromethanesulfonyloxy group, a methanesulfonyloxy group or a para-toluenesulfonyloxy group,

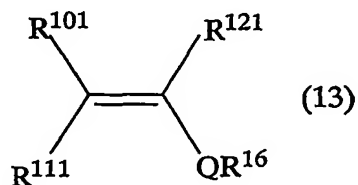
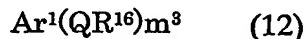
with an oxygen compound or a nitrogen compound of formula (11) below,



wherein  $R^{16}$  is an alkyl group, an aryl group which may be substituted or a heteroaryl group which may be substituted; Q is an oxygen atom,



wherein  $R^{17}$ ,  $R^{18}$  and  $R^{19}$  are each a hydrogen atom, an alkyl group, an aryl group which may be substituted or a heteroaryl group which may be substituted; and  $R^{16}$  and  $R^{17}$  may be combined to form a divalent aromatic ring which may be substituted, to give a compound of formula (12) or (13) below,



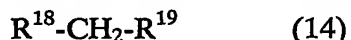
wherein  $Ar^1$ , Q,  $R^{16}$ ,  $R^{101}$ ,  $R^{111}$  and  $R^{121}$  are as defined above and

$m^3$  is an integer of 1 to 4.

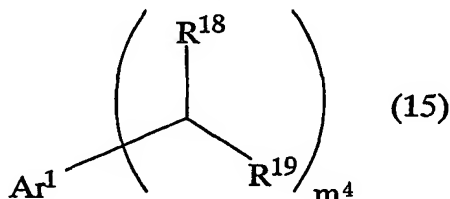
8. The manufacturing method of claim 4 or 5, which comprises reacting an aromatic compound of formula (3),



wherein  $\text{Ar}^1$  is an aryl group which may be substituted or a heteroaryl group which may be substituted;  $\text{X}^1$  is a chlorine atom, a bromine atom, an iodine atom, a trifluoromethanesulfonyloxy group, a methanesulfonyloxy group or a para-toluenesulfonyloxy group, and  $m^1$  is an integer of from 1 to 4, with a carbonyl compound or a cyano compound of formula (14),



wherein  $\text{R}^{18}$  is a hydrogen atom,  $\text{CO}_2\text{R}^{20}$ ,  $\text{C}(=\text{O})\text{R}^{21}$  or a cyano group;  $\text{R}^{19}$  is  $\text{CO}_2\text{R}^{22}$ ,  $\text{C}(=\text{O})\text{R}^{23}$  or a cyano group;  $\text{R}^{20}$ ,  $\text{R}^{21}$ ,  $\text{R}^{22}$  and  $\text{R}^{23}$  are each an alkyl group, an aryl group which may be substituted or a heteroaryl group which may be substituted, to give a compound of formula (15),



wherein  $\text{Ar}^1$ ,  $\text{R}^{18}$  and  $\text{R}^{19}$  are as defined above and  $m^4$  is an integer of 1 to 4.

9. The manufacturing method of claim 4 or 5, which comprises reacting an aromatic compound of formula (3),



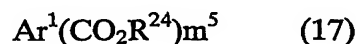
25 wherein  $\text{Ar}^1$  is an aryl group which may be substituted or a heteroaryl group which may be substituted;  $\text{X}^1$  is a chlorine atom,

a bromine atom, an iodine atom, a trifluoromethanesulfonyloxy group, a methanesulfonyloxy group or a para-toluenesulfonyloxy group; and  $m^1$  is an integer of from 1 to 4, with carbon monoxide and an alcohol of formula (16),



wherein  $R^{24}$  is an alkyl group,

to give a carboxylic ester of formula (17),

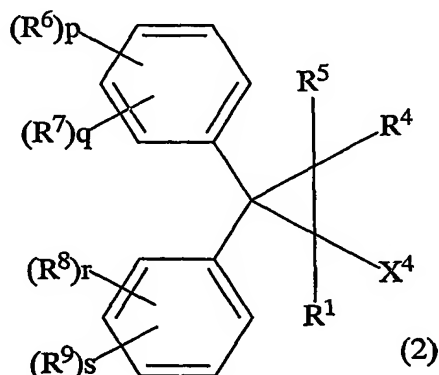


10 wherein  $Ar^1$  and  $R^{24}$  are as defined above and  $m^5$  is an integer of 1 to 4.

10. The manufacturing method of unsaturated compounds, as claimed in any one of claims 4 to 9, which comprises carrying out the reaction in the presence of a base.

15

11. A halogeno compound of formula (2) below,



20 wherein  $R^1$ ,  $R^4$  and  $R^5$  are each, the same or different, a hydrogen atom, an alkyl group, a cycloalkyl group or a phenyl group which may be substituted;  $X^4$  is a halogen atom;  $R^6$ ,  $R^7$ ,  $R^8$  and  $R^9$  are each, the same or different, an alkyl group, a cycloalkyl group or a phenyl group which may be substituted, an alkoxy group, a dialkylamino group, a halogen atom, a phenyl group, a benzyl

group, a naphthyl group or a halogenated alkyl group;  $R^6$  and  $R^7$ , and  $R^8$  and  $R^9$  each may be combined to form a fused ring, a trimethylene group, a tetramethylene group or a methylenedioxy group;  $p$ ,  $q$ ,  $r$  and  $s$  are each an integer of from 0 to 5; and

5  $p + q$  and  $r + s$  are each in the range of from 0 to 5.